CLAIMS

What is claimed is:

1   1.   A method for measuring client-side performance, the method comprising the steps of:

2   intercepting an item that is to be sent to a client process prior to the arrival of the item

3   at the client process;

4   modifying the item to produce a modified item that includes code which causes one

5   or more processors on the client device to perform the steps of:

6   measuring performance related to a service associated with the item, and

7   performing one or more acts based on a measurement resulting from said step

8   of measuring performance; and

9   sending the modified item to the client process.

1   2.   The method of Claim 1, wherein said step of modifying the item is

2   performed transparently relative to an application that generates the item for the

3   service.

1   3.   The method of Claim 1, wherein said steps of measuring performance

2   and performing one or more acts based on the measurement are performed

3   transparently relative to a user of the client process.

1   4.   The method of Claim 1, said step of performing one or more acts based

2   on the measurement further comprising the step of sending data indicating the

3   measurement to an entity over a network.

1   5.   The method of Claim 4, said step of sending the data to an entity further

2   comprising storing the data in a data structure that is automatically sent to a

3   server device associated with said service in response to a later request from the

4   client process for said service.

1   6.   The method of Claim 5, wherein:

2   the client process is a web browser; and

3   the data structure is a cookie stored on the client device by the web

4   browser.

1   7.   The method of Claim 4, wherein:

2   the step of modifying the item includes adding code to the item that causes the client

3   process to issue a request; and

4   said step of sending data to an entity further comprises sending the request including

5   the data to a server device.

1   8.   The method of Claim 7, wherein the request is for a particular file and in

2   response to the request for the particular file no change is made by the client

3   process to a page already rendered on a display of the client device.

1   9.   The method of Claim 4, further comprising storing the data indicating

2   the measurement in a log file on a server device.

1   10.   The method of Claim 4, further comprising storing the data indicating

2   the measurement in a database of the entity on the network.

1   11.   The method of Claim 1, further comprising the steps of:

2   receiving over a network data indicating the measurement from the client process;

3   and

4   performing one or more acts based on the data indicating the measurement.

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1 12. The method of Claim 11, said step of performing one or more acts based

2 on the data indicating the measurement further comprising:

3   determining whether the data indicates performance has fallen below a

4   threshold; and

5   if the data indicates performance has fallen below the threshold, then

6   sending a notification message.

1 13. The method of Claim 1, said step of performing one or more acts based

2 on the measurement further comprising:

3   determining whether the measurement indicates performance has fallen

4   below a threshold; and

5   if the measurement indicates performance has fallen below the

6   threshold, then sending a notification message.

1 14. The method of Claim 13, said step of sending a notification message

2 comprising sending the notification message to an administrator for a server

3 device associated with said service.

1 15. The method of Claim 13, said step of sending a notification message

2 comprising sending the notification message to a user of the client process.

1 16. The method of Claim 1, wherein the measurement is a client response

2 time between a first time when a user of the client process selects an item on a

3 first web page rendered on a display of the client device and a second time

4 when a second web page is fully rendered on the display of the client device.

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1   17.   The method of Claim 1, wherein:

2   the code further causes the one or more processors on the client device

3   to perform the step of collecting ancillary information relating to

4   one or more components of the client process that participate in

5   obtaining the service from the application; and

6   said step of performing one or more acts based on the measurement

7   includes correlating the measurement with the ancillary

8   information.

1   18.   The method of Claim 1, after said step of intercepting the item and

2   before said step of modifying the item, further comprising the steps of:

3   determining a type associated with the item produced by the application;

4   and

5   determining whether to perform said step of modifying the item based

6   on the type of the item.

1   19.   The method of Claim 1, after said step of intercepting the item and

2   before said step of modifying the item, further comprising the steps of:

3   determining a unique reference associated with the item produced by the

4   application; and

5   determining whether to perform said step of modifying the item based

6   on whether the unique reference matches a particular reference.

1   20.   The method of Claim 1, after said step of intercepting the item and

2   before said step of modifying the item, further comprising the steps of:

3   determining a percentage of modified items relative to items to be sent

4   to the client process; and

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5 determining whether to perform said step of modifying the item based

6   on whether the percentage is below a particular percentage.

1 21. The method of Claim 1, wherein:

2 the item to be sent to the client process is stored in a cache before the

3   item is sent to the client process;

4 said step of intercepting the item comprises accessing the item in the

5   cache; and

6 said step of sending the modified item to the client process comprises

7   replacing the item in the cache with the modified item.

1 22. The method of Claim 21, wherein the cache is on a server device

2 associated with said service.

1 23. The method of Claim 21, wherein the cache is on a proxy server for the

2 client process.

1 24. The method of Claim 1, wherein:

2 the item includes hypertext markup language (HTML) statements; and

3 the client process is a web browser.

1 25. The method of Claim 24, wherein:

2 the web browser is configured to run javascript; and

3 the code comprises javascript statements.

1 26. The method of Claim 1, wherein the code conforms to a scripting

2 language.

1 27. The method of Claim 1, wherein the code comprises a Java applet.

1   28.   The method of Claim 1, wherein the code comprises an ActiveX

2   module.

1   29.   The method of Claim 1, said step of modifying the item further

2   comprising appending the code to the end of the item.

1   30.   The method of Claim 1, wherein:

2   the item includes markup language statements; and

3   said step of modifying the item further comprises inserting the code at a

4   particular statement of the markup language statements.

1   31.   The method of Claim 1, wherein:

2   the code includes at least one of first code added to a first item and

3   second code added to a second item; and

4   said measuring performance comprises starting a time measurement

5   based on the first code and ending a time measurement based on

6   the second code.

1   32.   The method of Claim 31, wherein:

2   the first code is executed in response to a user of the client process

3   clicking on a control included in the first item; and

4   the second code is executed in response to fully loading the second item.

1   33.   The method of Claim 1, wherein the code includes first code executed

2   upon arrival of the first code at the client process and second code executed in

3   response to a data structure generated by the client process after arrival of the

4   first code.

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1   34.   The method of Claim 33, wherein the data structure describes an event

2   at the client device.

1   35.   The method of Claim 34, wherein the event is a message received from

2   an operating system executing on the client device.

1   36.   The method of Claim 34, wherein the event is a manipulation of a

2   control of the client device by a user.

1   37.   The method of Claim 33, wherein the second code causes the one or

2   more processors to perform the step of measuring performance.

1   38.   The method of Claim 33, wherein the second code causes the one or

2   more processors to record a current time.

1   39.   The method of Claim 33, wherein:

2   the item to be sent to the client process includes third code to be

3   executed in response to the data structure generated by the client

4   process; and

5   the first code causes the one or more processors to perform the step of

6   replacing the third with the second code.

1   40.   The method of Claim 1, wherein the code includes first code executed in

2   response to a data structure describing a first event generated by the client

3   process and second code executed in response to a data structure describing a

4   second event generated by the client process.

1   41.   The method of Claim 40, wherein:

2   the item to be sent to the client process includes third code to be

3   executed in response to the data structure describing the second

4   event by the client process; and

5   the first code causes the one or more processors to perform the step of

6   replacing the third with the second code.

1   42.   A computer-readable medium carrying one or more sequences of instructions for

2   measuring client-side performance, wherein execution of the one or more sequences of

3   instructions by one or more processors causes the one or more processors to perform the steps

4   of:

5   intercepting an item that is to be sent to a client process prior to the arrival of the item

6   at the client process;

7   modifying the item to produce a modified item that includes code which causes one

8   or more processors on the client device to perform the steps of:

9   measuring performance related to a service associated with the item, and

10   performing one or more acts based on a measurement resulting from said step

11   of measuring performance; and

12   sending the modified item to the client process.

1   43.   The computer-readable medium of Claim 42, wherein said step of

2   modifying the item is performed transparently relative to an application that

3   generates the item for the service.

1   44.   The computer-readable medium of Claim 42, wherein said steps of

2   measuring performance and performing one or more acts based on the

3   measurement are performed transparently relative to a user of the client process.

1   45.   The computer-readable medium of Claim 42, said step of performing

2   one or more acts based on the measurement further comprising the step of

3   sending data indicating the measurement to an entity over a network.

1   46.   The computer-readable medium of Claim 45, said step of sending the

2   data to an entity further comprising storing the data in a data structure that is

3   automatically sent to a server device associated with said service in response to

4   a later request from the client process for said service.

1   47.   The computer-readable medium of Claim 46, wherein:

2   the client process is a web browser; and

3   the data structure is a cookie stored on the client device by the web

4   browser.

1   48.   The computer-readable medium of Claim 45, wherein:

2   the step of modifying the item includes adding code to the item that causes the client

3   process to issue a request; and

4   said step of sending data to an entity further comprises sending the request including

5   the data to a server device.

1   49.   The computer-readable medium of Claim 48, wherein the request is for a

2   particular file and in response to the request for the particular file no change is

3   made by the client process to a page already rendered on a display of the client

4   device.

1   50.   The computer-readable medium of Claim 45, wherein execution of the

2   one or more sequences of instructions by the one or more processors further

3   causes the one or more processors to perform the step of storing the data

4   indicating the measurement in a log file on a server device.

1   51.   The computer-readable medium of Claim 45, wherein execution of the

2   one or more sequences of instructions by the one or more processors further

3   causes the one or more processors to perform the step of storing the data

4   indicating the measurement in a database of the entity on the network.

1   52.   The computer-readable medium of Claim 42, wherein execution of the

2   one or more sequences of instructions by the one or more processors further

3   causes the one or more processors to perform the steps of:

4   receiving over a network data indicating the measurement from the client process;

5   and

6   performing one or more acts based on the data indicating the measurement.

1   53.   The computer-readable medium of Claim 52, said step of performing

2   one or more acts based on the data indicating the measurement further

3   comprising:

4   determining whether the data indicates performance has fallen below a

5   threshold; and

6   if the data indicates performance has fallen below the threshold, then

7   sending a notification message.

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1   54.   The computer-readable medium of Claim 42, said step of performing

2   one or more acts based on the measurement further comprising:

3   determining whether the measurement indicates performance has fallen

4   below a threshold; and

5   if the measurement indicates performance has fallen below the

6   threshold, then sending a notification message.

1   55.   The computer-readable medium of Claim 54, said step of sending a

2   notification message comprising sending the notification message to an

3   administrator for a server device associated with said service.

1   56.   The computer-readable medium of Claim 54, said step of sending a

2   notification message comprising sending the notification message to a user of

3   the client process.

1   57.   The computer-readable medium of Claim 42, wherein the measurement

2   is a client response time between a first time when a user of the client process

3   selects an item on a first web page rendered on a display of the client device and

4   a second time when a second web page is fully rendered on the display of the

5   client device.

1   58.   The computer-readable medium of Claim 42, wherein:

2   the code further causes the one or more processors on the client device

3   to perform the step of collecting ancillary information relating to

4   one or more components of the client process that participate in

5   obtaining the service from the application; and

6   said step of performing one or more acts based on the measurement

7   includes correlating the measurement with the ancillary

8   information.

1   59.   The computer-readable medium of Claim 42, wherein execution of the

2   one or more sequences of instructions by the one or more processors further

3   causes the one or more processors, after said step of intercepting the item and

4   before said step of modifying the item, to perform the steps of:

5   determining a type associated with the item produced by the application;

6   and

7   determining whether to perform said step of modifying the item based

8   on the type of the item.

1   60.   The computer-readable medium of Claim 42, wherein execution of the

2   one or more sequences of instructions by the one or more processors further

3   causes the one or more processors, after said step of intercepting the item and

4   before said step of modifying the item, to perform the steps of:

5   determining a unique reference associated with the item produced by the

6   application; and

7   determining whether to perform said step of modifying the item based

8   on whether the unique reference matches a particular reference.

1   61.   The computer-readable medium of Claim 42, wherein execution of the

2   one or more sequences of instructions by the one or more processors further

3   causes the one or more processors, after said step of intercepting the item and

4   before said step of modifying the item, to perform the steps of:

5   determining a percentage of modified items relative to items to be sent

6   to the client process; and

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7   determining whether to perform said step of modifying the item based

8   on whether the percentage is below a particular percentage.

1   62.   The computer-readable medium of Claim 42, wherein:

2   the item to be sent to the client process is stored in a cache before the

3   item is sent to the client process;

4   said step of intercepting the item comprises accessing the item in the

5   cache; and

6   said step of sending the modified item to the client process comprises

7   replacing the item in the cache with the modified item.

1   63.   The computer-readable medium of Claim 62, wherein the cache is on a

2   server device associated with said service.

1   64.   The computer-readable medium of Claim 62, wherein the cache is on a

2   proxy server for the client process.

1   65.   The computer-readable medium of Claim 42, wherein:

2   the item includes hypertext markup language (HTML) statements; and

3   the client process is a web browser.

1   66.   The computer-readable medium of Claim 65, wherein:

2   the web browser is configured to run javascript; and

3   the code comprises javascript statements.

1   67.   The computer-readable medium of Claim 42, wherein the code conforms

2   to a scripting language.

1   68.   The computer-readable medium of Claim 42, wherein the code

2   comprises a Java applet.

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1   69.   The computer-readable medium of Claim 42, wherein the code

2   comprises an ActiveX module.

1   70.   The computer-readable medium of Claim 42, said step of modifying the

2   item further comprising appending the code to the end of the item.

1   71.   The computer-readable medium of Claim 42, wherein:

2   the item includes markup language statements; and

3   said step of modifying the item further comprises inserting the code at a

4   particular statement of the markup language statements.

1   72.   The computer-readable medium of Claim 42, wherein:

2   the code includes at least one of first code added to a first item and

3   second code added to a second item; and

4   said measuring performance comprises starting a time measurement

5   based on the first code and ending a time measurement based on

6   the second code.

1   73.   The computer-readable medium of Claim 72, wherein:

2   the first code is executed in response to a user of the client process

3   clicking on a control included in the first item; and

4   the second code is executed in response to fully loading the second item.

1   74.   The computer-readable medium of Claim 42, wherein the code includes

2   first code executed upon arrival of the first code at the client process and second

3   code executed in response to a data structure generated by the client process

4   after arrival of the first code.

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1 75.   The computer-readable medium of Claim 74, wherein the data structure

2 describes an event at the client device.

1 76.   The computer-readable medium of Claim 75, wherein the event is a

2 message received from an operating system executing on the client device.

1 77.   The computer-readable medium of Claim 75, wherein the event is a

2 manipulation of a control of the client device by a user.

1 78.   The computer-readable medium of Claim 74, wherein the second code

2 causes the one or more processors to perform the step of measuring

3 performance.

1 79.   The computer-readable medium of Claim 74, wherein the second code

2 causes the one or more processors to record a current time.

1 80.   The computer-readable medium of Claim 74, wherein:

2   the item to be sent to the client process includes third code to be

3   executed in response to the data structure generated by the client

4   process; and

5   the first code causes the one or more processors to perform the step of

6   replacing the third with the second code.

1 81.   The computer-readable medium of Claim 42, wherein the code includes

2 first code executed in response to a data structure describing a first event

3 generated by the client process and second code executed in response to a data

4 structure describing a second event generated by the client process.

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1   82.   The computer-readable medium of Claim 81, wherein:

2   the item to be sent to the client process includes third code to be

3   executed in response to the data structure describing the second

4   event by the client process; and

5   the first code causes the one or more processors to perform the step of

6   replacing the third with the second code.

1   83.   A method for responding to client-side performance on a network connecting a client

2 device executing a client process to a server device configured to execute an application to

3 provide a service, the method comprising the steps of:

4   intercepting an item produced by the application;

5   modifying the item transparently relative to the application to produce a modified

6   item including code which causes one or more processors on the client device

7   to perform the steps of,

8   measuring performance related to the service provided by the application, and

9   based on a measurement resulting from said step of measuring performance,

10   sending data indicating the measurement to the server device;

11   sending the modified item to the client process;

12   receiving the data indicating the measurement;

13   storing the data indicating the measurement in a database; and

14   based on the data indicating the measurement,

15   determining whether the data indicates performance has fallen

16   below a threshold, and

17   if the data indicates performance has fallen below the threshold, then sending

18   a notification message.

1   84.   A computer-readable medium carrying:

2   data indicating elements for presentation on a display of a device having one or more

3   processors by a client process executing on the one or more processors;

4   a first sequence of instructions executed upon receipt at the device; and

5   a second sequence of instructions invoked after arrival of the first sequence of

6   instructions by the client process,

7   wherein,

8   the second sequence of instructions causes the one or more processors to

9   perform the steps of:

10   measuring performance related to presenting the elements on the

11   display; and

12   performing one or more acts based on a measurement resulting from

13   said step of measuring performance; and

14   the first sequence of instructions causes the client process to associate the

15   second sequence of instructions with an element indicated by the data.

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